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MOMII '7

MECHELECIV

THE STUDENTS MAGAZINE • VOL. 29 • NOVEMBER 1970 • No. 2

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DEPARTMENTS

COVER

Faster than an electron drift, more powerful than a gas turbine, able to leap long suspension bridges in a single bound, and who, disguised as a GWU engineer, fights a never ending battle for sex, booze, and cheap thrills. It's super engineer.

Illustrated by Steve Momii

FRONTISPIECE

The old and the new!

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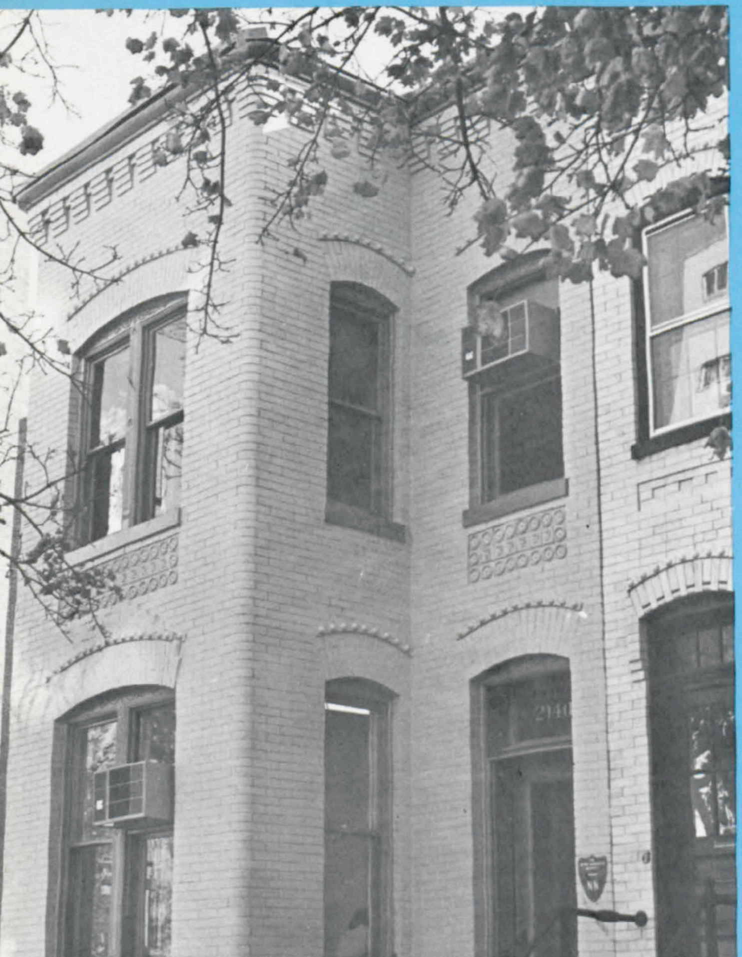
THE OLD



AND THE NEW

MECHELECIV

THANK YOU, MR. EINBINDER

Among today's youth, there is a belief that people of the so-called "Establishment" can not or will not respond to petitions of grievances or assistance unless prompted by unorthodox means.

Last spring, when it was learned that the Davis-Hodgkins House was going to be leveled for the site of the new library, it would have been easy for the engineers to follow suit with the rest of the campus and rant and rave and demand satisfaction. But, after the initial shock over the impending doom of the "D-H" House, the Engineers' Council decided on what turned out to be a much more profitable channel of negotiation than "sitting in" the Business Office of the University and demanding a new house right away.

By working with Mr. Einbinder, the business manager of the university, the Engineers' Council President was able to secure for the students of the School of Engineering and Applied Science a new house far beyond the expectations of any of the students involved.

We of Mecheleciv would like to thank Mr. Einbinder not only for an excellent solution to the engineering students' housing problem but also for showing us that in most cases an equitable consideration is given to those who select to work within the system.

Greg C. Eichert
Editor

LETTERS TO THE EDITOR

Dear Editor:

I was surprised and somewhat disappointed to find only supporting comments on Mr. Harmon's Editorial in the April Mecheleciv. Mr. Harmon was very disturbed by the way "our Engineers' Council handled what little opportunity came its way to utter its seldom heard voice on something other than the price of hot dogs for a luncheon". He admits that the Council can not presume to represent the political views of SEAS, but then contradicts himself by suggesting that as your representatives, the Council should consider making voicing political statements. Actually, he did not come right out and say that the Council should consider making political statements, but rather that the Council state something besides who was going to pay for a luncheon. He suggests that the Council's refusal to consider making a statement was due to some fear of possible consequences emanating from the student body. He says again that he sees "some merit" in the argument that the Council was not elected to pass off its opinions as those of the student body, but that "these last few months have been a strain on all student governing bodies all over the country", by which he seems to imply that the Council should therefore assume the right to make political statements regardless of the student body.

I believe that Mr. Harmon has not grasped the essence of representative government. If the Council were to make statements on political issues under the guise of a representative body of SEAS, it would only alienate itself from the body which it is supposed to represent. Mr. Harmon's inference that the Council does little more than decide on luncheon expenses indicates his ignorance of the dramatic changes that have taken place in the Council in the last year, and its continued improvement as an active student government of SEAS.

Robert S. Grant

Dear Sir:

I have been a member of the university community for a period of slightly over two years, and have never been moved to write a letter like this before. However, the problem I am about to present seems to get worse as I further my education. The problem I'm referring to is; professors who read directly from the text during their class sessions.

I first encountered this problem my very first semester here when I was able to sit in my Chemistry 11 class and underline in the text the exact words this professor spoke. One can write this off by saying, "Well, no university is perfect", or you can say "It's only in liberal arts that you confront the problem". Well my friend, engineering is no different. In fact, it is probably worse. On one given day all four of my professors could be found to be reading from the text (two do it regularly).

I guess my real complaint is why should I be paying $1,000.00 a semester tuition when a trip to the bookstore and about $100.00 could achieve the same purpose.

Sincerely,
A poor junior

Dear Editor:

I would just like to take a moment to congratulate the editor and staff of the Mecheleciv this year.

The first issue this year is one of the finest that I have yet seen. From cover to cover there seems to be some improvement in each department of the magazine.

Steve Momii has outdone his usual artistic level with a cover that is superior not only to any of the past issues of Mecheleciv, but is far above any of the other engineering school magazines that I have seen this year.

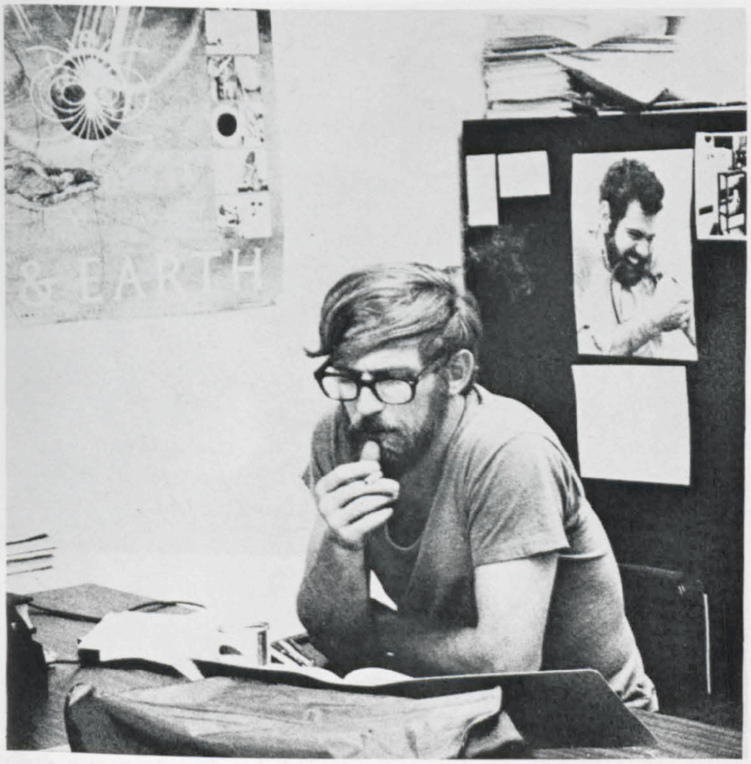
Tech News which is usually just a collection of technically oriented trivia has found enough relevant and interesting material to produce some worthwhile reading.

However, far and away the most impressive part of the magazine is the article by Ray Grant. For the first time in my memory we have a feature article that was written by an undergraduate at the undergraduate level.

The Mecheleciv staff has created something we can all be proud of. Let's hope that they maintain their high standards in future issues.

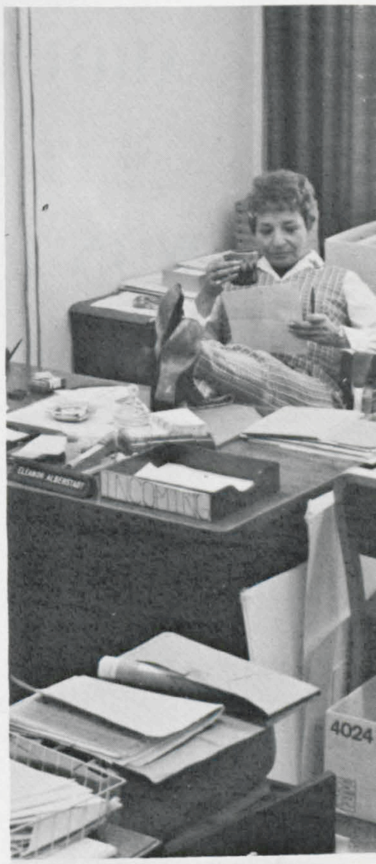
Michael Rothschild

LETTER TO THE EDITOR POLICY. The opinions set forth in the "Letter to the Editor" page of this magazine are not necessarily the opinions of the staff of *Mecheleciv* magazine. This page is set aside each issue for use by students, alumni, faculty, and staff of the School of Engineering and Applied Science. The staff will also accept letters from other sources if the letters concern the magazine or would be of interest to the students, alumni, faculty, and staff of the S.E.A.S. *Mecheleciv* reserves the right to edit any letter if lack of space deems it necessary. If, in the opinion of the Editorial Staff of *Mecheleciv*, a letter appears to be unprintable, the staff reserves the right to return the letter to the sender stating the staffs' reasons for withholding it from publication. All letters must be signed; however, pen names may be substituted if requested.



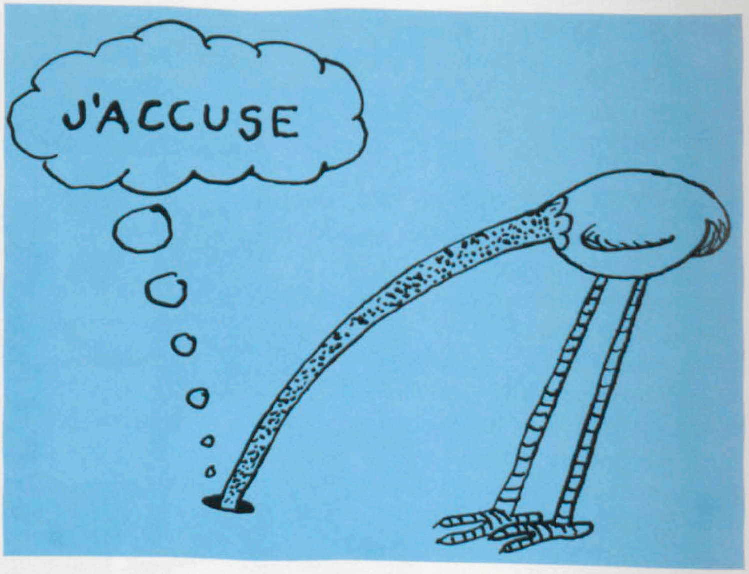
Dear Dirty Dan.

When the boss is away.



Someone forgot the beer.

THINK ABOUT IT – WON'T YOU?



by Bruce Nixon EE

Man has made so much technological progress in his little time on earth, but he will have a great price to pay. Technology has formed a society where political and economic power is becoming concentrated and centralized. Can democracy continue to flourish in a society such as this?

As man's machines become more efficient, they become more complex and, naturally, more expensive – thus, less available to the small business man or limited output industrialist. Will the Little Man, traditionally so important to the capitalist society, disappear? Will the State eventually come to control these millions of small industries? To paraphrase Churchill: Never have so many been manipulated by so few. Is this Jefferson's democracy?

True, there must be organization; the strength of democracy lies in the self-regulating, cooperating community. But organization can become fatal if human beings become automatic, the creative spirit is stifled, and the possibility of freedom seems to vanish. Still, as technology has advanced, organization has advanced correspondingly – for machines to work there must be organization, but if the human being is dehumanized, is it worth it?

Pure science cannot long remain pure; soon it becomes applied science, and finally, technological and industrial power. Conclusion: Knowledge is Power. For this reason, we must be educated for freedom, with the individuality of the human spirit in mind. We must state facts and examine values; we cannot afford to either ignore facts nor deny values. We cannot afford to lose touch with our creative spirit nor our capacity to examine, evaluate, and choose, for an unexciting truth can easily be coated by an exciting falsehood. Regimentation would truely be a misfortune.

We must act upon our knowledge. But do people really care about halting our gradual drift towards totalitarianism? America is a sadly prophetic image of the future because so many young people have lost their faith in democracy as they see it, and in their governmental institutions. Many young people have risen up in protest against the growth of technology and against the docility and passiveness of the parental generation (Paul Goodman calls it "the-nothing-can-be-done disease"). The adults have, in essence, lost control of the situation, seeming neither to care about nor understand their political, social, and cultural roles in society. Their children are alienated from them. Their response is oriented towards experience and the freedom of human expression in all creative, cultural, and social activities.

But there are, of course, those who do not take any real active interest in either their own fates or the forces that influence their lives. This is the young television generation that proudly exclaims "We are as free as birds," but have forgotten that the dodo no longer exists.

Because the engineer is a personification of technological progress, he must begin to examine his role in society. Traditionally, the engineer has considered himself a scientist and has viewed his role in political and cultural affairs as limited. To a certain extent, this is a stereotype, but its validity cannot be denied.

Today, technology is moving at a fantastic rate; however, mankind has not been able to keep up this pace socially, culturally, or emotionally. Man will eventually reach a point where he can cope neither with himself nor his surroundings.

The race is won by running slow.

PROBLEMS:
A COMMON BOND

by Edwin S. Eichert III

I was raised in a family of engineers. My father is the president of Technitrol, Inc., a manufacturer of delay-lines and pulse transformers. My uncle is a graduate of an electrical engineering school, and now works in engineering sales. My brother is an electrical engineering student at George Washington University. I studied in the Moore School of Electrical Engineering at the University of Pennsylvania, where I graduated in May, 1970.

It seems reasonable to assume that I should know what an engineer does; but I have never obtained what I felt was an adequate description; and I'm not sure I can suggest one. While I was in school, I worked as an engineer, and am currently employed as an engineer. So during the next few pages, while describing the work I've done and some of my current projects, I hope to shed some light on the question, "What is an engineer?" In closing, I will offer one answer drawn from my experiences and observations.

During my junior and senior years, I worked for a small research firm near Philadelphia. One of my early assignments was the design and construction of electrical control and data collection equipment, for use in a rat conditioning experiment. The subject was alternately exposed to fresh air and odorized air within a special enclosure, and he was trained to bar press during one or the other conditions. Once training was completed the electrical parameters affecting the odorized air were varied, and their effect on the rat's responses were studied. Later, the olfactory tissue from a frog was placed in the test enclosure and an electro-olfactrogram was recorded under several conditions.

Another task involved the design and execution of an experiment to study the effects of low power, ultra high frequency, electromagnetic radiation on the heart function of a common grass frog. I was required to design and construct an electrode system capable of sampling an electrocardiogram within a pulse modulated U.H.F. field, such that the electrodes had a minimal effect on the field density within the test area. I was called on to design a control system to permit automatic data collection, and was given a major responsibility for the execution of the experiment. This experiment was completed over a year ago, and it is only now in the final phases of analysis. For a large portion of my senior year, my part time job involved a thorough literature review and some limited experiments in holography.

These jobs all seem suitable for an electrical engineer. They involved circuit theory, design, equipment interface, electronics, and several other engineering areas. But they also involved biology, psychology, physiology, and physics. It seems if we could determine how all these jobs are alike, that we would have a better idea of how to answer the question, "What is an engineer?" A discussion of my current employment should serve to demonstrate the diversity of engineering endeavors, and it might help to resolve our question.

I am employed by the Westinghouse Electric Corporation in the Computer & Instrumentation Division. My position is Associate Manufacturing Engineer, and I work in the Production Planning Section. My supervisor is an engineer, who worked in a design capacity on the Bay Area Rapid Transit System (BART), see MECHELECIV Vol. 28, May 1970.

Figure #1 shows the organizational chart for the Computer & Instrumentation Division. It will aid in a description of the Material and Production Planning Department's role within the division. We interact with upper level management in at least three ways. We test the long range goals of the division. We offer suggestions on methods to meet these goals. We schedule the production and inventory

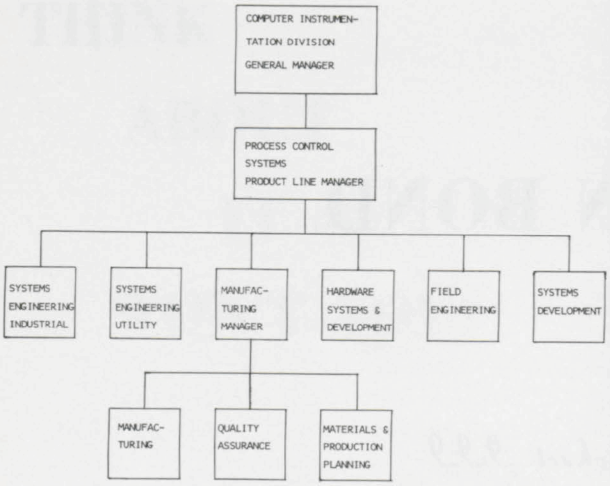


Figure 1 — A Simplified Division Organizational Chart

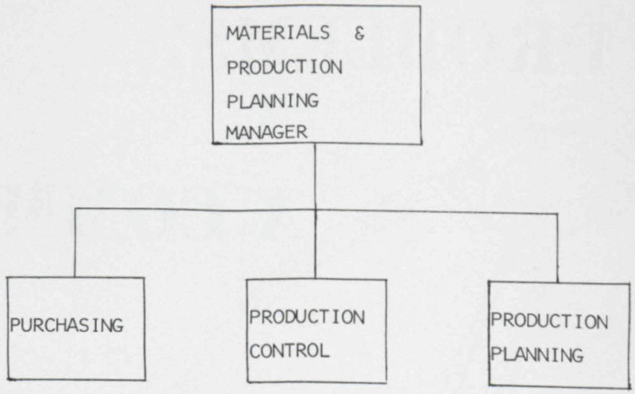


Figure 2 — The Materials and Production Planning

requirements necessary to meet the division objectives. This scheduling involves defining material, manpower, and time requirements in line with the customer's order. Our interface with the several engineering and development departments is "N-fold." We attempt to schedule the time required in different phases of the engineering process. We convert engineering specifications into manufacturing information. Finally, we schedule, track, and order parts for the production of every customer order and every development project. Our function requires frequent communication with all levels of manufacturing and quality assurance. We load level and priority rate their areas, track their progress, and evaluate their performance.

Our department is organized as illustrated in Figure #2. It is divided into three equally important sections. Production planning schedules production and specifies material requirements. It also converts engineering designs into manufacturing information, and it processes several records for accounting. Purchasing orders the materials necessary to meet the specified inventory requirements at the lowest cost. Production Control maintains the inventory and polices the schedules obtained from the Planning Section.

Nine people work together to carry out the production planning function. There are three engineers. As one of the engineers, I concentrate on long and intermediate term scheduling. My work can be divided into two categories. Those which I call daily chores, and those which might be called long term development projects. Daily chores include such things as order approval, schedule interpretation, schedule maintenance, and processing problem orders. These are not in general dull, as my description might imply; but on occasions, some tasks, such as schedule maintenance can become tedious. Normally, tedious work can be avoided if the proper decision is made regarding the use of a computer. An easy rule of thumb states: "Use the computer whenever the same job must be repeated in the future."

I am working on, or thinking about, several long term projects. I have written a program which will generate delivery dates for printed circuit board orders, and am working on a technique to determine build quantities and build priorities from forecasted printed circuit board requirements. Some more sophisticated projects involve modifications of our printed circuit board scheduling technique, and a dynamic scheduling program for computer system projects within the division. These endeavors serve one of two purposes. Either they make my daily tasks easier, or they improve the sections ability to perform its function. We will discuss one project in detail. An examination of some of my ideas regarding a dynamic Mechanized Master Schedule would illustrate a variety of the functions which are performed by engineers in this organization. It would also demonstrate what I feel is my most interesting long term project.

The overall goal of any manufacturing organization is simply to achieve the largest possible return on investment. The Westinghouse Electric Corporation has formulated a manufacturing purpose which it believes will enable its several divisions to obtain the largest long run profit. Our manufacturing goal is, "to satisfy customers' needs for quality products delivered on time, at the lowest possible cost and with maximum asset turn over." By planning and tracking computer system production and by testing and evaluating our forecasted sales plan, the Dynamic Mechanized Master Schedule will aid considerably in meeting our overall manufacturing purpose. The schedule will help to insure on-time delivery, reduce our investment period, and provide data for cycle time reduction.

To meet the division's requirements, I first tried to determine the specific functions which the Mechanized Master Schedule should accomplish. After discussions with other personnel, evaluation of our current scheduling

methods, and extensive reading, I developed what I felt were the minimum functions to be included in the Master Schedule program. The eleven minimum requirements are:

1. To define and record an ideal production schedule for every project.
2. To accept external changes to the production schedule, up to the point when delivery rates are specified to the customer.
3. To track the progress of each project through the production process, and to adjust the actual production schedule based on the tracking information.
4. To accept external changes to the actual production schedule for any unaccomplished production steps.
5. To store the necessary data for, and to permit scheduling based on, either infinite or finite scheduling techniques within any or all production steps.
6. To priority rate each project based on both critical ratio techniques and external priority inputs.
7. To indicate the effects of discrepancies from the ideal schedule, and to identify corrective strategies.
8. To provide parts and equipment requirements in bi-weekly increments; this includes printed circuit boards, panels, cables, sub-assemblies, and cabinets for each project and each work area.
9. To list manpower, space, and machinery requirements for each project and each work area.
10. To update parts, equipment, manpower, space, and machinery requirements based on feedback and advanced inputs from the production process.
11. To interface with other programs, by providing inputs to the inventory control program and several short term scheduling programs.

Several companies with relatively simple, high volume, short cycle-time products have developed scheduling programs which are much more sophisticated than the one which will perform the functions just listed. Our product, process control computers, is rather complex, individually designed, and carefully built. They require an averaged cycle-time of between forty-two and fifty weeks. Due to the nature of our product, more elaborate scheduling techniques would be difficult, of limited value, and unreasonably expensive.

Unfortunately, even with our products extremely long cycle-time, the period between the date when the system is completely described and the date when manufacturing begins, is rather short – approximately three weeks. This period is not long enough to obtain any parts which are not already ordered, in time for the manufacturing schedule. Attempts are made soon after order conception and at several other points during the production process to approximate material requirements. Our approximations must be improved to better support the manufacturing process. One solution to this problem, the one which will be used in the Mechanized Master Schedule program, is the use of a system classification scheme. Using this approach, system requirements will be based on type until more accurate information is available for planning. At this point, predicted material requirements will be used to better our description of the parts required. After this time, data will be revised as new information is available.

There are three ways which could be used to classify projects. In the dynamic *Mechanized Master* Schedule program, we will use a multi-variable function combining all three classification techniques. The first method is functional. All of the systems that we build can currently be classified into one of nine different groups; Power Systems-nuclear, Power Systems-fossile fuel, Other Utilities, Process Control-metal, Process Control-chemical, Other Process Control, Special Projects industrial, Special Projects-development, and all Other Projects. Reviewing some of our accomplishments; one of our systems controls a six-stand, 80-inch hot-strip steel mill, which would of course be classified 'Process Control-metal'. Another of our systems uses a PRODAC-580 to provide on-line control of a 350-ton-per-day continuous pulp digester; this would be classified as 'Process Control-chemical'. As of early 1969, the Computer & Instrumentation Division has installed computers to control 101 fossile fuel generators and 25 nuclear generators. Classification of these applications is obvious, but the system which completely controls and operates an automobile warehouse would present some difficulty. We might classify it as 'All Other Projects' or 'Special Projects-Industrial'. Ambiguities such as this must arise from time to time. As they do, an intelligent decision must be made; in time, with practice, the usefulness of our decisions will improve. Just as applications for process control computers are endless, so are the number of functional classifications. However, at present, the nine mentioned are adequate. The Master Schedule program will be written in such a manner as to permit changes and additions to the functional classes. The program will accept up to twelve of these classes.

Another suitable technique for the classification of projects is the type of computer which must be built to meet the system demands. This classification system may seem more useful than the functional method mentioned earlier. In fact, it probably is; but obviously, the combination of both methods is better than either one alone. Quite frequently, the same computer will be employed in several different functional areas, likewise, projects with the same functional classification might require different computers. Further, the same basic computer system will have differences depending on application. We currently manufacture systems which employ three different computers; the PRODAC-50 a moderate capacity process control computer, the PRODAC-250 an extended capacity multipurpose computer, and the PRODAC-2000 a variable capacity process control computer. There are currently four other machine classifications used to describe different systems. As in the case of functional classification, the

program will accept changes and additions to the equipment classification scheme. The program will permit up to ten different classes of machines.

A final area of classification considers the number of computers required to fulfill the system requirements. In most cases where multiple computers have been employed, they have been the same type of computer. Further, few systems call for more than two machines. Thus, the classifications based on number will be, One and Two-Or-More. In sum, the classification technique will be a multivariable function which defines the unique computer systems; 126 of these are currently required.

We have two interconnected production systems which operate simultaneously. One system concerns the construction of computer systems; the other operates to support the system construction process. This support system is composed of several functions which are planned independently of any specific projects. The total requirements of all projects, and the needs of other Westinghouse divisions are combined to develop our inventory plan, our ordering points, and an intelligent make-to-stock program. The support demands several links with the project construction system. These interconnections will be discussed at appropriate points later in the paper. Figure #3 shows a functional diagram of the steps which form a unique production process for every process control computer system. This process should be directly tracked and planned by the Master Schedule, and the information transmitted by the Master Schedule to the support system must depend on the status of every project. We will discuss each production step, because of the key roll played by engineers and because an understanding of each step is essential to the development of the dynamic Mechanized Master Schedule.

When a customer decides he is interested in the possibility of computer control, in general, he does not know his requirements or the capabilities of process control systems. The Customer Information step provides this knowledge. The customer's process is analyzed to determine if computer control is warranted, and if it is to recommend a suitable control computer. We recommend interfacing equipment, and we indicate ways to preserve the customer's previous investment. Finally, the Customer Information phase includes long-range planning, to insure the customer the largest possible gain for his investment. The decisions and discussions which occur are formalized into a contract defining what will be controlled and what computers will be employed. This step involves one to six engineers and several other skilled workers for an average period of nine to eleven weeks.

One of the systems which has almost completed the Customer Information phase is a process control computer for a large pharmaceutical production facility. The system will employ a Westinghouse PRODAC 250 computer to control manufacturing for six different drugs. The project coordinator, Vikram Pearce, and four other engineers have suggested a direct digital control technique for the process involved. Traditionally, information is fed from the computer via a digital-to-analog converter to the manufacturing process. This requires expensive modifications each time new control devices are desired. To meet the same requirements with direct digital control involves simple programming modifications.

During Customer Information, the engineers involved in the project become familiar with the system requirements. When Customer Information is completed, the design function is begun. The Engineering Design step involves combining several standard units to form a completed

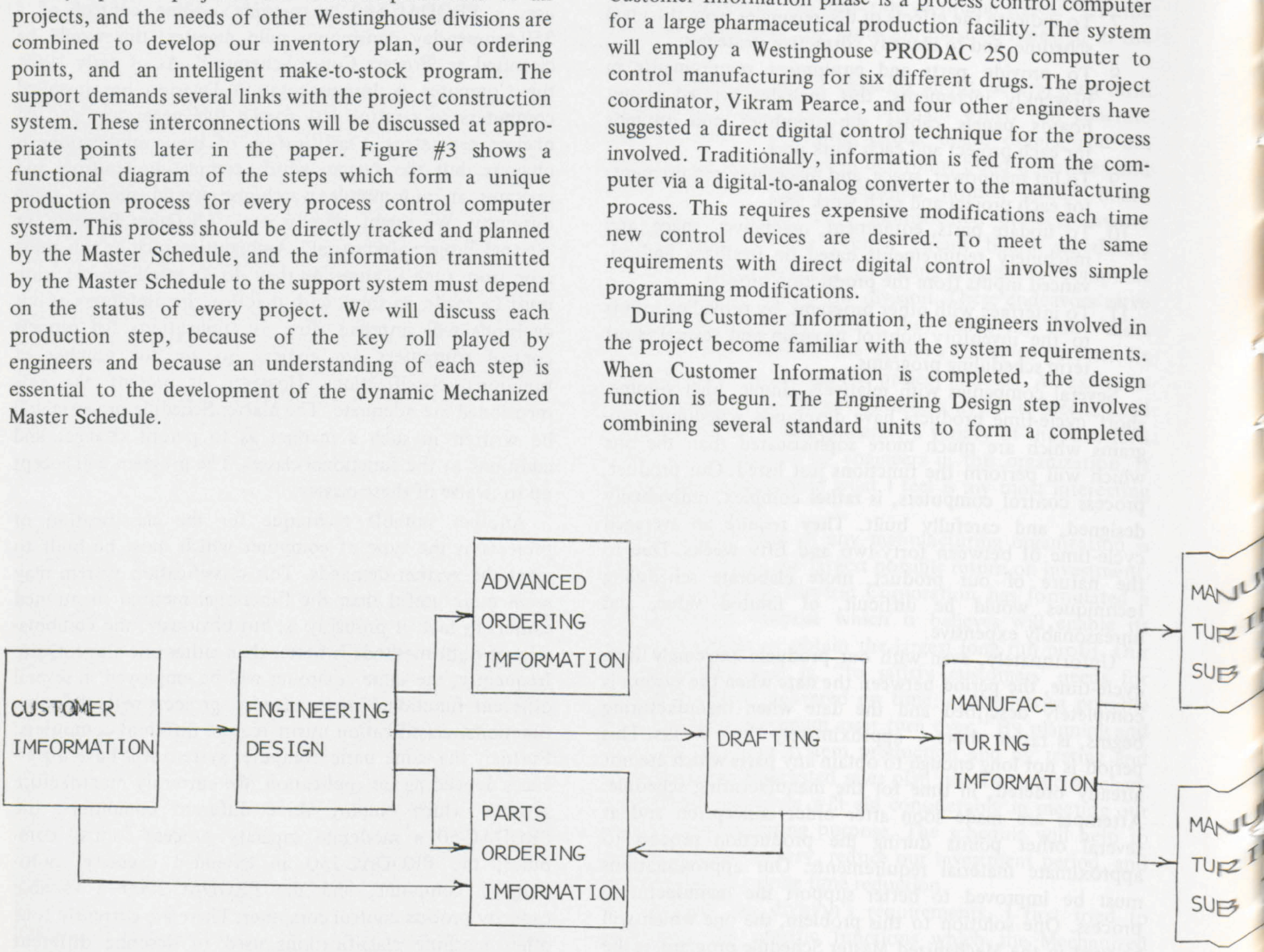
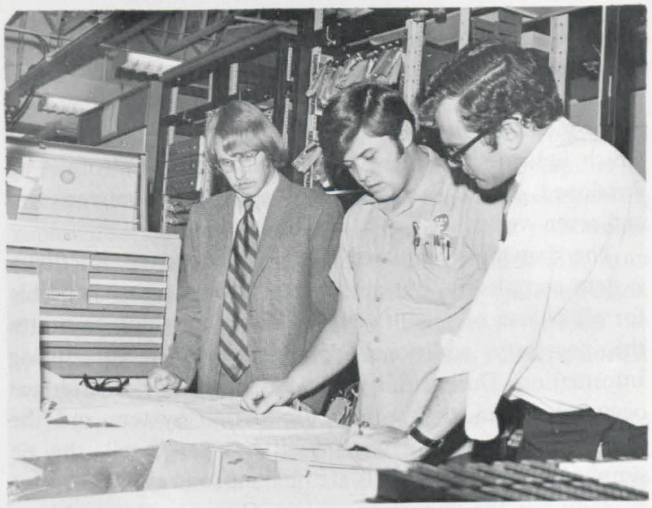


Figure 3 – The Project Production System

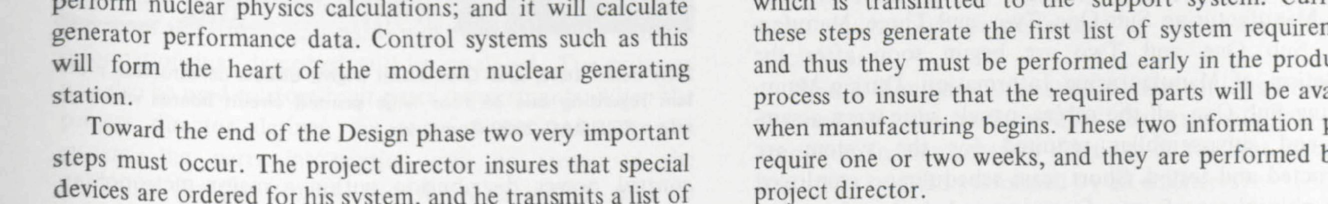
system. It also requires special design for equipment to interface with the customer's production facility; and it might entail the development of special devices to interface system subassemblies, or to control a completely new process. The Engineering Design phase requires one to four engineers or more depending on the complexity of the project. The step involves an average of four to seven weeks.

A system currently in the Engineering Design phase is another PRODAC 250, which will aid in the control of a nuclear power plant. Ted Lee, the project engineer, and his engineering group are working on a general purpose system which will perform several functions previously accomplished by repetitive human observations. Some of their major problems have been the development of networks which will generate computer inputs based on the values of several different parameters. When completed, the computer system will continuously scan several different nuclear power generator parameters. It will convert this information into suitable engineering data; it will test for malfunctions and signal problems as they occur; it will maintain a continuous log of plant operations; it will perform nuclear physics calculations; and it will calculate generator performance data. Control systems such as this will form the heart of the modern nuclear generating station.

Toward the end of the Design phase two very important steps must occur. The project director insures that special devices are ordered for his system, and he transmits a list of standard requirements to the Production Planning Department. These steps are called Advanced Ordering Information and Parts Ordering Information respectively. These steps form the first major link between the project production system and the support system. When the dynamic Mechanized Master Schedule program is completed, these steps will be used to improve the information which is transmitted to the support system. Currently, these steps generate the first list of system requirements, and thus they must be performed early in the production process to insure that the required parts will be available when manufacturing begins. These two information phases require one or two weeks, and they are performed by the project director.


J.R. Neyer (far left) discusses some last minute design changes with fellow employees.

Drafting commences when the Design step is finished and generally after the interactions described above. In this phase, the design work completed by engineering is converted to symbolic illustrations, which describe the entire system. Drawings which describe standard assemblies



are collected and reproduced. For new pieces of equipment, a complete set of drawings must be produced. These include; schematic diagrams, wiring diagrams, parts layouts, and printed circuit board artwork. Finally, a set of drawings which indicate the interconnections of every unit must be developed. This entire Drafting phase requires between five and seven weeks.

The drawings completed in the Drafting step describe a system completely, but not necessarily in a manner suitable for all phases of manufacturing. The step which generates the necessary additional data is called Manufacturing Information. During this phase the second major interface occurs between the project production system and the support system. Hopefully, if all has gone well, the tie simply insures that all parts are on hand, and manufacturing is ready for the upcoming project. Occasionally, problems arise and quick corrective measures must be accomplished. If the dynamic Mechanized Master Schedule serves its purpose, the frequency of problem occurrence during this phase should be considerably reduced. This step requires between two and four weeks, and it is performed entirely by highly skilled technicians.

The manufacturing process is divided into three steps called Manufacturing Sub One, Two, and Three. Manufacturing Sub One and Two are begun soon after the completion of Manufacturing Information. During Manufacturing Sub One, all the cables, panels, wire-wrap assemblies, and subassemblies required for the system are constructed and tested. Short term scheduling is employed during this phase of manufacturing and during the other two steps. These schedules are revised weekly during a production meeting. Currently, the dynamic Mechanized Master Schedule program would aid us considerably in the development of short term schedules, but its major effect will be in providing better information for priority rating and progress reporting.

Manufacturing Sub Two requires approximately two weeks longer than Manufacturing Sub One. During this phase all the printed circuit boards required for the project must be built and tested. To reduce the time required for this step, and to use our printed circuit board facility to its greatest advantage, has required the development of a make-to-stock program for printed circuit boards. Unfortunately, all the boards required for any given project are not necessarily included in our make-to-stock program. The Master Schedule, through its requirements generating function, should greatly improve our make-to-stock program, and it should reduce the number of parts which must be constructed during this phase.

The last manufacturing step Manufacturing Sub Three encompasses the final assembly of the entire computer system. We normally allot two or three weeks for this phase.

An example of a system which is in the final manufacturing step is a PRODAC 2000, which will be used to dispatch power by a large electric utility company. When completed, the system will distribute the load requirements for several areas in a manner which will insure the most efficient operation of the generating systems involved. Of course, the system will maintain operations records, and take corrective measures when problems occur. The project director, P.H. McDermott, is in charge of five similar projects. When they are all completed they will completely control power distribution within a major metropolitan area.

Don Beam (left) and Glen Lohn (right) discuss construction problem regarding one of four large printed circuit boards which go into a PRODAC 2000 Computer.

The reliability of a computer system is dependent on the reliability of every component which goes into the system. PRODAC computer systems have consistently met the utility reliability standards of 99 percent availability. In order to meet this standard, we have developed a philosophy of performing a 100 percent test on every item from raw materials to completed systems. Thus, when Manufacturing Sub Three is finished, Hardware Test begins. Engineers write the test procedures and solve problems which arise during the test step. This step requires between four and five weeks.

The Software process begins immediately upon completion of Hardware Test. Engineers work on program development during the entire production process. However, it takes a considerable length of time to actually program the machine to meet the customer's requirements. The programming of every computer system must be completed and checked before the project can be shipped. Frequently, we will use one of our own computers to simulate the customer's process. We then interface the project computer with our own and check the systems operation under simulated conditions. Software can require anywhere from two weeks to twenty-six weeks depending on the complexity of the system. The average time requirements for this step are between six and seven weeks.

One of our standard projects is currently in the Software phase. It is a PRODAC 50 which will be used to control a gas turbine generator. The computer starts the generator, accelerates it, locks it in phase, and brings it on line. The process occurs either automatically or by human input during peak power periods. With computer control, the entire process requires less than seven minutes. During generator operation, the computer system monitors operation, and protects the generator in the event of a malfunction. Mr. J.A. Pesavento, the project director for most gas turbine systems, depends on three systems engineers during the software phase.

The remaining production steps, Inspection, Packing, and Shipping occur very quickly relative to the rest of the production process. They are normally completed within a week after the Software complete date.

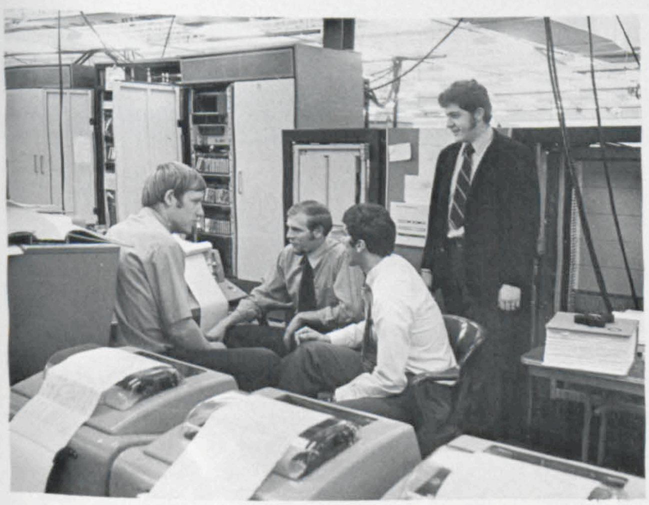
In review, we should mention some of the dynamic Mechanized Master Schedule program requirements. It will store data to compute several pieces of information for each production step by project type. This information will include, personnel, equipment, time, and space requirements; and the total availability of each. As each step is completed, forms will be filled-out by a suitable employee, and from the forms, data cards will be keypunched and the information just described will be up-dated. The program will also be used to store built parts requirements. When the project director defines the parts which make up the system, the parts information will be stored in the computer for the project, and this data will be used to improve the type information records. Finally, the Master Schedule program must generate several reports, printed circuit board and equipment requirements in bi-weekly increments, and area work loads and efficiency reports. Due to the extensive sorting and file maintenance requirements, the program will be written in COBOL and it will operate in a computer system similar to the IBM 360/75. We anticipate four months to define, program, and debug this system before it can be used on a day-to-day basis.

We have seen that engineers play a major role in all phases of production at the Westinghouse Computer & Instrumentation Division. Their jobs include management, supervision, development, and design; and their responsibilities encompass every phase of system production, from contract negotiations to parts ordering to system design. Clearly it is impossible to describe engineers in terms of the specific jobs they do. If we attempted such a description, it would be longer than this article.

If someone described my present job to me while I was in school, I would have concluded that he thought I was a business major or maybe a computer programmer. The job seems less like an electrical engineer's than the part time job I had while I was in school. I claim, however, that the work I'm doing is best suited to an engineer, and because of our product line, an electrical engineer is probably most suited to the task. The real proof of this claim lies in the common bond between all engineers; but as partial proof, let us note that Westinghouse would not be the successful corporation they are today if they regularly hired engineers to perform tasks which could be performed by personnel from other disciplines.

What is common to the several different jobs I've had, or the several tasks performed by the engineers here in the computer instrumentation division, or for that matter the multitude of tasks performed by all engineers?

The common bond between all engineers is a love for problems. And the common characteristic between all engineering tasks is that they are best accomplished by an organized disciplined problem solution technique. Most



In the left photo Tony Colgini (standing) discusses some programming problems with three other engineers on a PRODAC 250 Computer system. In the right photo, J. Pesavento (left) points to a possible problem which occurred during software.

engineers approach problems in a manner that involves five steps.

1. Research the problem; determine everything that is known about the task at hand.
2. Define the problem in useful terms. Convert the general problem into discrete specific increments.
3. Choose an approach; this might be a principle which yields a set of equations, a computer program, or something as vague as an idea.
4. Carry out the approach; solve the equations, write the program or try the idea.
5. Evaluate the solution; compare the solution with what you expected, test the solution with previously solved problems, and insure that the solution solves the problem.

Learning this approach, practicing it, mastering it, and making it part of every engineering student is the heart of every engineering education. The different engineering disciplines serve to give a student a set of problems which will hopefully interest him and to provide him with a body of basic knowledge which may be applicable to some of his future problems. The engineering approach differs from the scientific method and the academic review; further, it has proven itself to be very successful in dealing with a wide variety of problems and tasks. Our problem solution technique is our common bond, and it is our greatest asset.

Mr. Eichert has attended the University of Hawaii and the University of Pennsylvania. He graduated from the latter with a Bachelor of Science degree in Electrical Engineering in May of 1970. He is currently enrolled at the University of Pittsburgh, where he is studying for a Master's degree in Electrical Engineering.

Mr. Eichert spent three years in the United States Army, where he worked as a radio repairman. He has been employed by the Department of Biomedical Electronic Engineering at the University of Pennsylvania and by Randomline, Incorporated. He is currently employed in the Production planning department at the Westinghouse Computer Instrumentation Division.

Mr. Eichert is a member of Sigma Tau and Eta Kappa Nu electrical engineering honor fraternities. He is also a member of several professional societies including the Institute of Electronic and Electrical Engineers where he belongs to the groups on circuit theory and electron devices.


Imay

MECH MISS

AMY FREEDMAN

Those who frequent the Rathskeller will be sure to recognize this month's Mech Miss. Twenty-year-old junior Amy Freedman, measuring 100010-10110-100010 (for those who can't figure this one out, its 22-16-22 in hex), is an education major who hopes to work eventually with children. She also enjoys music, dancing, sports, and travel along with her interest in children. The daughter of an engineer, Amy is, as you can see, another beautiful product of engineering know-how.

Photos by Jeff Davis

Mech Miss found by 'Dirty' Dan

WHAT MAKES

The field of engineering means not only the taming and harnessing of the properties of matter and energy, but also finding the methods by which they can be used to their greatest efficiency. Most important, methods must be found to use energy without harm to the environment or waste of our natural resources. Engineering must meet the demands of a modern society and continue to advance the technology required to build our evolving civilization.

One of my personal reasons for choosing engineering as a major is that this occupation proves to be a real challenge to an individual's knowledge of logic, understanding of the physical laws, and organization. In other fields, such as physics and chemistry, one seldom gets an opportunity to apply the laws formulated by research in these subjects on the outside world. An engineer may not formulate the theories needed for a project, but he can watch his work grow and become complete. The engineer does not stay only at his desk and direct the course and action of others; he goes out and makes sure that the work is being done correctly, that his plans are being followed exactly, and that the materials are of the right quality to stand the stress and use to which they will be applied.

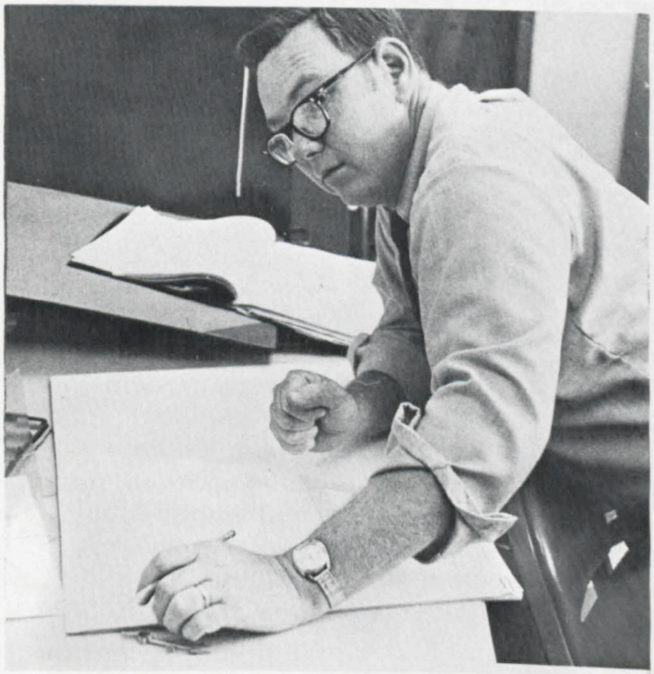
There are several reasons which influenced my choice of Mechanical Engineering as a career. One reason is the nature of engineering itself. A mechanical engineer designs and builds more advanced systems to serve mankind. Not content with adequacy, the engineer is always striving ahead, improving or updating lode concepts or throwing them away and formulating new ones. Theories must be tested in practice, and the engineer does just that. Another reason for my choice of Mechanical Engineering as a career is that it will allow me to advance many of my hobbies and interests. One hobby I've had for many years is designing and building models of aircraft. Later on in high school I joined a small model rocketry club where we built and launched our own rockets. Of course, the space program is a major interest of mine also.

My major goal in life is to continue my studies in engineering past a B.S. in Mechanical Engineering to a M.S. in Aerospace Engineering. Even more than Mechanical Engineering, here is where my major interests are centered with designing and building aircraft and spacecraft as my special interest. There is great room for expansion, I think, now that the exploration of space has truly begun.

I have been asked many times by my friends, why I chose George Washington University. One reason is the Co-op program offered by the Naval Research and Development Lab, not to mention the many other projects available to the engineering student who is not content with waiting until graduation to apply himself to his field. Another reason is that the curriculum is as good and probably better than most other engineering schools contained in a large university. Also, many professors, such as Dr. Freudenthal and Dr. Foa are experts in their field, not to mention Dean Liebowitz. The graduate programs here are also excellent including the programs offered by the Nasa-Langley Institute. The facilities, which are already rather good, are being expanded and improved. The School of Engineering and Applied Science is a developing school, and it is here, I think, that more progress will be made, than at any established school.

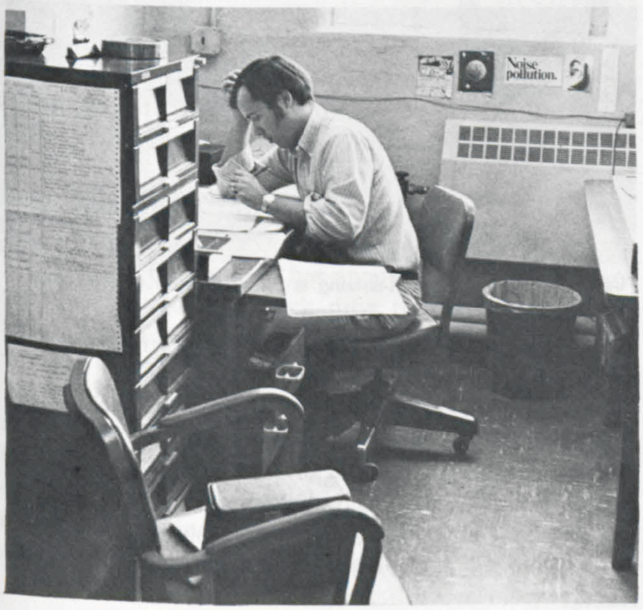
All any profession can give are feelings of satisfaction, productivity and usefulness. Mechanical Engineering holds all of these for me.

Joseph P. Schmidt
Freshman
Mechanical Engineer



N ENGINEER

Watt Smith



When I was a student at Vanderbilt some thirty-odd years Ago Dean Lewis insisted that the development of engineers with knowledge in all types of engineering should be the object of the engineering school. He had little patience with the usual academic divisions and demanded that all students take a number of courses foreign to their respective geometry, contract law – to name a few. Every year since graduation it has been necessary to learn more skills of other branches of engineering to and in the understanding of my own field of friction and wear processes and materials.

It seems to me that the challenge imposed by my own curiosity has been the chief motivating force in my own career and that of many fellow engineers. The curiosity of why brings the challenge to see if it can be achieved within the constraints of time, technology, money, etc. The challenge is not reserved to purely technical goals but extends to ways of selling your ideas to customers that have a problem and obtaining the resources required for a solution. The engineers curiosity to see if he can meet each of the challenges he confronts makes him accept each new challenge as it arrives.

Editors Note:

Watt Smith is one of the top engineers at the Naval Ship Research and Development Lab at Annapolis, Maryland where he is the head of the friction and Wear Branch of the Department of Materials Technology.

TECH NEWS

Edited by Bruce A. Nixon, EE'72

EASY-TO-USE OFFICE COMPUTER ANNOUNCED BY IBM SYSTEM/3 MODEL 6

A new computer, the IBM System/3 Model 6, is designed for businesses that until now have had to rely upon desk calculators or bookkeeping machines for daily accounting tasks. It can even process the ledger cards used by many small businesses.

The versatility of Model 6 also extends to "conversational" problem-solving. Managers, engineers and scientists can interact with the system from the same typewriter-like keyboard used to enter data for accounting applications. They can perform lengthy financial calculations, design bridges or solve complex mathematical problems.

Firms now using ledger cards can gain the efficiency and reliability of stored program computing with System/3 Model 6 without giving up those familiar visual records.

Model 6, like the previous version of System/3, uses advanced monolithic circuit technology for all arithmetic and logic functions. An entire system requires only slightly more floor space than an office desk. Other features that extend the usefulness of the system include:

- Direct keyboard data entry;
- High-capacity disk storage;
- A visual display unit for quick looks at account records and job results;
- Printing forward (left to right) and backward (right to left), and
- The ability to communicate with other IBM computer systems.

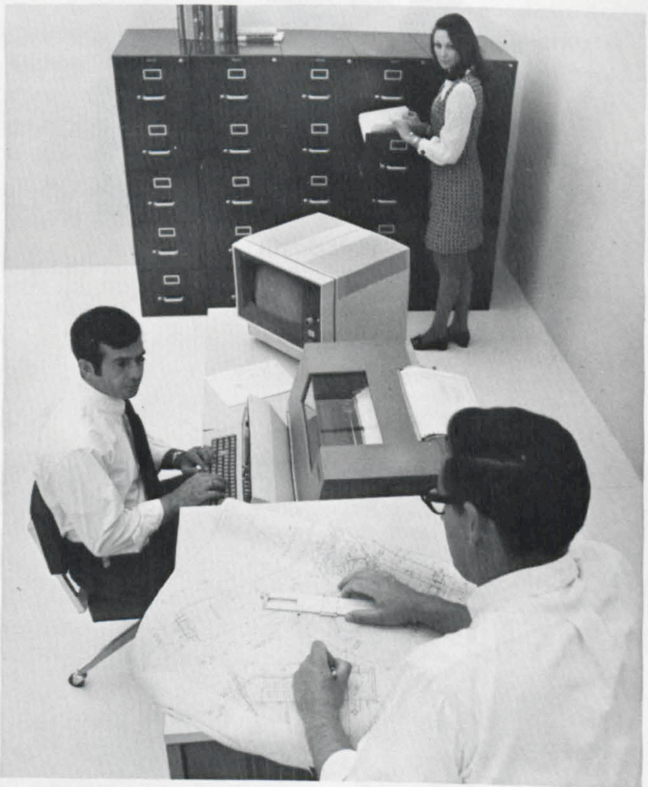
With relatively little training at the Model 6's typewriter-like keyboard, a billing clerk can produce invoices, a manager can check the status of any customer account or inventory record, or an engineer can analyze a pipeline network. The data for these and many other applications is stored in high-capacity disk files that are an integral part of the system.

Business applications – including billing, inventory control, accounts receivable and sales analysis – are the "bread and butter" uses of Model 6. They are supported by proven and powerful RPG II programming.

Users can easily switch from accounting to mathematical problem-solving by typing a single command into the console keyboard. For example, a building contractor who runs his payroll and project cost reports on the system in the morning can sit down at the Model 6's keyboard in the afternoon to solve a tough job scheduling problem.

This is possible with another easy-to-use programming language, called BASIC, which lets engineers, scientists, educators and businessmen "converse" and interact with the computer to tackle most mathematical problems.

If the BASIC user gets stuck with an operating procedure, he simply types the word HELP. The computer then prints a message explaining the mistake and the correct use of the procedure.



"Conversational" problem-solving is a key feature of the versatile IBM System/3 Model 6.

Architects or engineers solving problems that involve repetitive calculations often need a quick look at intermediate results. At the push of a button, this information can be flashed on a television-like screen. The visual display also can be used in commercial applications for fast checking of an inventory level or a customer's payment record.

FORWARD/BACKWARD PRINTING, LEDGER CARDS

Users can select any of five different console printers. When the user requires extensive printed copy, he can take advantage of Model 6 printer options that provide the extraordinary ability to print in two directions. After the printing element reaches the end of a line moving left to right, it prints the next line from right to left. Billing, stock status reports, accounts receivable statements and other high-volume output can be speedily printed in this manner.

With the user's records stored in the computer's disk files, ledger card processing becomes easier than ever before. The operator simply drops the ledger cards in a feed slot. The system automatically retrieves current data from its disk files and posts it to the cards.

Ledger cards can be updated by the system in batches. This reduces card handling and makes the cards readily available to the people who use them.

COMMUNICATIONS CAPABILITY

System/3 Model 6 can serve insurance companies, motor freight firms and other medium and large organizations as a processing terminal. For example, branch offices or warehouses can communite data from the Model 6 to centrally located IBM System/360s, System/370s, and other System/3s.

Small banks can attach the IBM 1255 magnetic character reader to System/3 Model 6 for low-cost processing of magnetically-inscribed checks and other documents.

Users who wish to batch-process information with IBM 96-column punched cards can use an on-line data recorder with the Model 6. Information is keyed into the cards by an operator and then read into the system by the data recorder. The data recorder also can be used as an output device to punch cards.

IBM System Engineering Services are available to provide assistance to System/3 Model 6 customers on site, or in IBM Basic System Centers throughout the country. Programming guidance, program testing, instruction and applications design are among the services offered.

NEW DISK PACK DRIVE MEMORY SYSTEMS

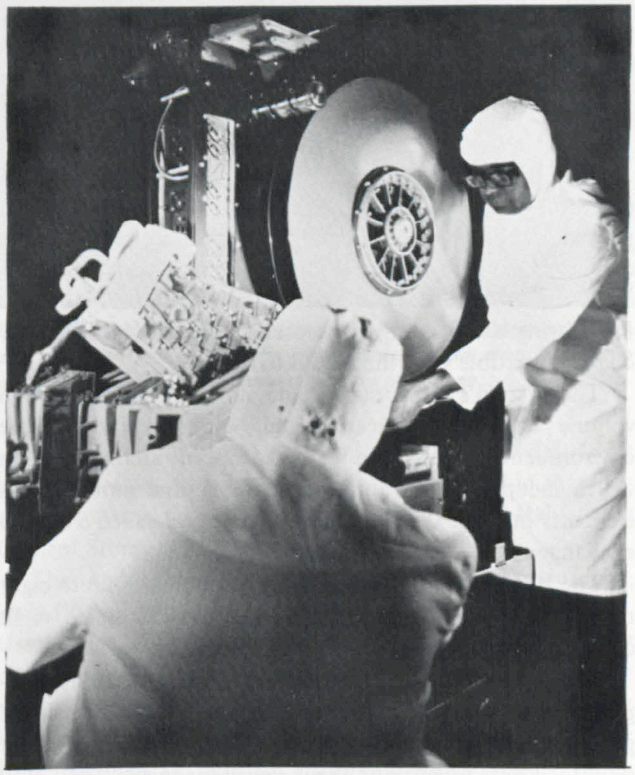
Burroughs Corporation has announced a new family of magnetic actuator disk pack drive memory systems with high capacity and unsurpassed performance for Burroughs new B 6700 and B 7700 computer systems.

Availability of these economical and flexible disk pack drives, coupled with simultaneously announced head-per-track disk file memory systems with high performance capabilities, provide Burroughs B 6700 and B 7700 customers with the industry's widest choice of random access storage hierarchies to fit their applicational requirements.

There are two basic disk pack drive memory system models, each with different access times and a range of storage capacities. Both models contain two disk pack drives in dual-drive cabinets. Each drive has its own separate power supply and associated electronics. Because of the independence of each drive within a cabinet, one drive can be operational while the disk pack of the other is being removed.

Both random access disk pack drive systems have a high performance magnetic "voice coil" type actuator mechanism that gives an average track location time of only 30 milliseconds.

The model with a 12.5 millisecond average latency time, with its associated control, has a storage capacity of 121 million bytes (characters) expandable to 970 million bytes.



Assembly of the new disk files is shown in a Burroughs plant clean room. The new disk file memory systems include Optimized Access Memory Banks which can yield effective access times in the range of 2 to 6 milliseconds.

The model with an 8.4 millisecond average latency time has a capacity of 200 million bytes, expandable to 1.6 billion bytes per single or optional dual control. Either disk pack drive system offers a single or optional simultaneous data access path to B 6700 and B 7700 memory.

These disk pack drives have data transfer rates of 312,500 or 806,000 bytes per second and recording densities of 2,200 or 4,000 bits per inch, respectively.

The individual disk packs are each certified by Burroughs for 200 tracks-per-inch recording and are removable and fully interchangeable among the same disk drive type.

Each disk-pack surface has its own read/write head mounted on a moveable comb-like arm mechanism. The maximum head movement time across all tracks is 55 milliseconds and the minimum from track to track is 10 milliseconds.

The arm that guides the read/write heads over the disk tracks is activated by the highly reliable magnetic "voice coil" mechanism.

Other features which contribute significantly to the reliability of the new disk-pack system include:

- A fail-soft exchange structure to provide complete simultaneity and redundancy for non-stop operation.
- An extensive automatic error detection and correction capability completely independent of the central processor.
- An automatic relocation of uncorrectable data areas without movement of the read/write arm.

THE B 7700

The B 7700 – the most advanced, largest and most powerful of Burroughs 700 Systems family – is a very fast parallel processing system with exceptional versatility in configuration. Central processors, input/output processors and memory modules can be combined in a variety of ways in tailoring the system to the user's exact needs. It is fully code compatible with the new B 6700.

The system's performance and its adaptability to high volume data communications and very large data base environments results from its advanced architecture in which independent computing, memory and input/output elements interact through an electronic grid called a central exchange.

The B 7700 central exchange accommodates up to eight memory subsystems and a combination of up to eight central processors or input/output processors.

In B 7700 systems, the central exchange permits independent communication between memory modules, central processors and input/output processors. Multiple read/write/compute operations occur simultaneously.

The 16 mHz central processor incorporates a special integrated circuit memory with a speed of 62.5 nanoseconds whose "look ahead" ability virtually eliminates fetch time overhead for program strings. Performance is further increased by use of the special memory as an extension of Burroughs unique stack architecture. Through use of the special memory, program and computation sections operate independently and in parallel.

The input/output processors control data flow to disk file memory subsystems and all peripheral units. Capable of data transfer rates of up to eight million bytes per second, the input/output processor controls up to four disk memory controls, 20 peripheral controls, four data communication processors, and an adapter for a disk file optimizer. The input/output processor may be expanded to include up to four additional disk controls and a second disk file optimizer.

The B 7700 accommodates up to eight memory subsystems. Memory modules within a subsystem have a capacity of 786,432 bytes and a speed of 1.5 microseconds for 12 bytes with two-way phased interleaving. A second memory subsystem has module capacity of 1,572,864 bytes, with a speed of 1.5 microseconds for 24 bytes with four-way phased interleaving.

The B 7700's 60-bit word consists of 48 data bits, three control bits, a parity bit, and eight error correction bits which provide "single bit" error correction in all systems.

A high degree of fail-soft reliability is provided by these error correcting memories, the system software (Master Control Program), multiple data paths, residue checking and error detection circuitry, availability of redundant hardware, and independent, distributed power supplies.

Specialized data communications processors (DCP) introduced with the 700 Systems equip the B 7700 to handle large, complex networks.

Operating through the B 7700's input/output processor or processors, each DCP acts as a programable interface between the central system and communications lines. An input/output processor can service up to four DCP's operating in parallel.

Four DCP's, in turn, can service a network of up to 1,024 lines and can accommodate a wide range combination of terminals, controllers and remote computers, such as Burroughs input and display systems, TC series, TU 100 series of data collection and inquiry terminals, DC 1000 series of data concentrators, audio response systems and others. Systems configured with multiple input/output processors can service multiple DCP networks.

Burroughs disk file memory systems featured in the new release offer a variety of operating techniques, access speeds and capacities. B 7700 systems may be equipped with any of the following:

- Modular random storage with average access speeds of 20 or 35 milliseconds and capacities of 15 million to 112 million bytes.
- Optimized Access Memory Banks with an effective data access speed in the range of two to six milliseconds.
- Magnetic Actuator Disk Pack Drive memory systems, with 30 millisecond average access time to a data track and modules of 121 million to 1.6 million bytes.

IBM SYSTEM/370 MODEL 145

In a major departure from conventional computer technology, International Business Machines Corp. today introduced its first computer using a main memory made entirely of monolithic circuits.

To store its data and instructions, the new IBM system/370 Model 145 uses silicon memory chips, rather than the magnetic core technology that has been the

mainstay of computer memories for the past 15 years. More than 1,400 microscopic circuit elements are etched onto each one-eighth-inch-square chip.

Monolithic circuitry also is used throughout the Model 145's central processor to perform all of the system's arithmetic and logic functions.

With the Model 145, many more business and scientific users can obtain the increased performance-per-dollar advantages of System/370. They will not have to reprogram their existing applications written for System/360 and earlier IBM computers. The first models of System/370, the 155, and 165, were introduced in June for users of larger systems.

"In the Seventies, up-to-the-minute information from a computer data base is as vital to the people who run medium-sized organizations as it is to those who run large ones," said F.G. Rodgers, president of IBM's Data Processing Division. "The Model 145 has all the characteristics needed to make advanced data base applications practical and profitable for intermediate system users."

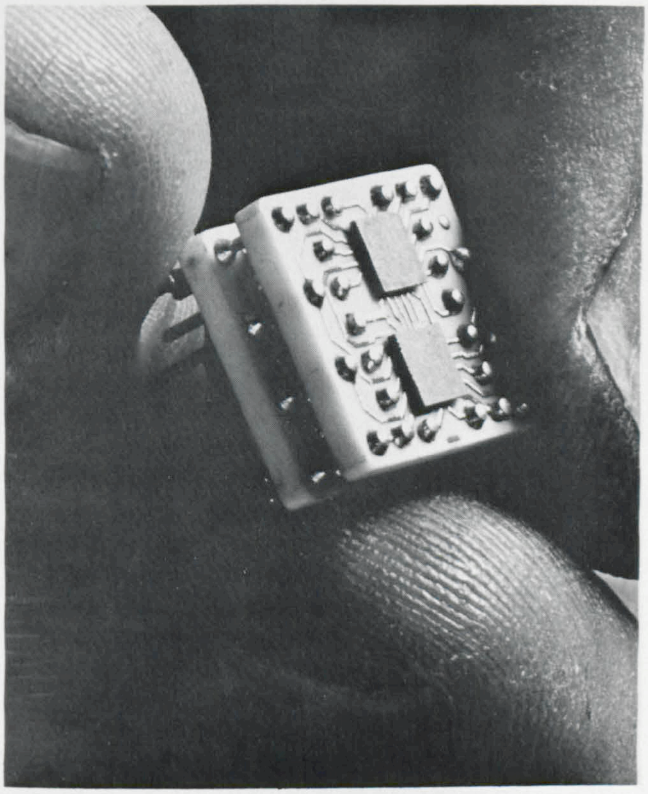
One of the key advantages of the Model 145 for multiprogramming and data base applications is its ability to use IBM's newest and fastest disk storage devices. They include the IBM 3330, and a new disk storage facility, the IBM 2319. The 2319, available only with the Model 145, has a capacity of 87-million characters of information, expandable to 233-million. It attaches to the central processor, thereby eliminating the cost of a separate disk control unit.

In conventional memories, data is stored in magnetically charged cores strung on wires. The use of monolithic memory technology, with its very high circuit density, allows IBM to offer Model 145 users more than a half-million characters of high-speed storage in about half the space that would be required by core planes for an equivalent amount of memory. The more than 1,400 circuit elements on each monolithic chip are interconnected to make up 174 complete memory circuits.

IBM has pioneered the use of monolithic memory technology units highest performance computers, which include System/370 Models 155 and 165 and System/360 Models 85 and 195. In those systems, monolithic memory technology is used in high speed buffers that match the speed of very large main core memories to that of the central processors.

The Model 145's internal operating speed is up to five times faster than that of the widely used System/360 Model 40, and up to 11 times faster than the Model 30's. Users have a choice of six main storage capacities, from 112,000 to 512,000 characters – twice the maximum available with System/360 Model 40.

The ability to run programs written for earlier IBM computers, including the 1400 Series and 7010, is provided with the Model 145 at no additional charge. Users can also run Disk Operating System programs under control of the more powerful Operating System without programming.



Conventional core memories, consisting of magnetic rings strung on wires, require about twice the overall space as the monolithic chip memory to achieve an equivalent amount of storage.

Another innovation that enhances the Model 145's efficiency is a reloadable section of monolithic memory that augments the main memory. It is called Reloadable Control Storage (RCS).

The code for the basic System/370 instruction set, including all system control functions, is stored in the RCS. Users will be supplied with a pre-written disk cartridge containing all needed instructions, as well as those for selected optional functions. Options might include the instructions that enable the Model 145 to emulate earlier IBM machines of perform arithmetic with extended precision to 34 decimal digits.

The console operator can load instructions from the disk cartridge into RCS in about 45 seconds. The standard 32,000 characters of control storage provided with each Model 145 can be expanded to 64,000 by using a portion of main memory, if needed, to accommodate optionally available functions.

FUTURE DEVELOPMENT OF COMPUTER-DRAWN SKETCHES FOR USE IN HIGHWAY DESIGN TO BE EVALUATED

A recent major development in highway design makes it possible for the designer to have a preview of his finished work in the form of computer-generated graphic displays.

The machine is programmed with design information and data describing the terrain where the highway will be built, and the computer then automatically sketches at predesignated scale various views of the finished highway, including the driver's view as he motors along. Obviously, the engineer can correct any undesirable features by merely changing the programming of the computer – a much easier and less expensive method than waiting till after the highway has been built.

To make the best use of the graphic display evaluation techniques, there is a need for better understanding of the relationship between the designer and the computer, so that he can quickly and easily change design parameters as a result of evaluating graphic displays, and direct the computer to make the necessary adjustments and produce new displays accordingly.

A Chicago company, the Control Data Corporation sponsored by the National Highway Cooperative Research Program of the Highway Research Board will review the present "state-of-the-art" in computer-generated graphic displays. There will be special emphasis on the Road Design Subsystem of Total Integrated Engineering Systems currently being developed by the Federal Highway Administration but will also review techniques developed for uses of computer graphics.

Control Data Corporation will then develop a system design that will describe in detail the software needed to develop more effective interactive computer-graphics system capability for use by the highway designer in effecting revisions to designs. Emphasis of the project is entirely on software, and no hardware development is contemplated, although the researchers will analyze the computer and graphical display hardware that will be needed to support the software system design.

The contract recently signed by NCHRP with Control Data Corporation represents the first phase of a full-scale research effort on interactive graphic systems for highway design. Phase I should be completed by July 31, 1971.

The NCHRP was created in June 1962 as a means to accelerate research into particularly acute problems affecting highway transportation on a nationwide scale. It is sponsored by the American Association of State Highway Officials in cooperation with the Bureau of Public Roads of the U.S. Department of Transportation's Federal Highway Administration.

The Highway Research Board was organized in 1920 and is a cooperative organization of highway transportation technologists of America. The Board's purpose is to advance knowledge of the nature and performance of transportation systems through the stimulation of research and the dissemination of information resulting from such research.

The Board operates within the Division of Engineering of the National Research Council, which serves both the National Academy of Sciences and the National Academy of Engineering.

FACULTY SPOTLIGHT:

DR. ROGER H. LANG

by David Forsyth

Dr. Roger H. Lang has recently joined the faculty of SEAS this fall as an Assistant Professor in the Electrical Engineering and Computer Sciences Department.

The courses he is teaching this fall are a Fields and Wave course (EE 31) and Electromagnetic Waves (EE 133). In the future, he would like to teach courses in Electromagnetic Wave Propagation (EE 234) and Microwaves and Components (EE 233).

Dr. Lang received his BSEE, MSEE, and doctorate from the Polytechnic Institute of Brooklyn. He has co-authored papers on the "Current Density and Magnetic Field Measurements on an Electrodeless Discharge" and on the "Lateral Waves on Diffuse Dielectric Interfaces".

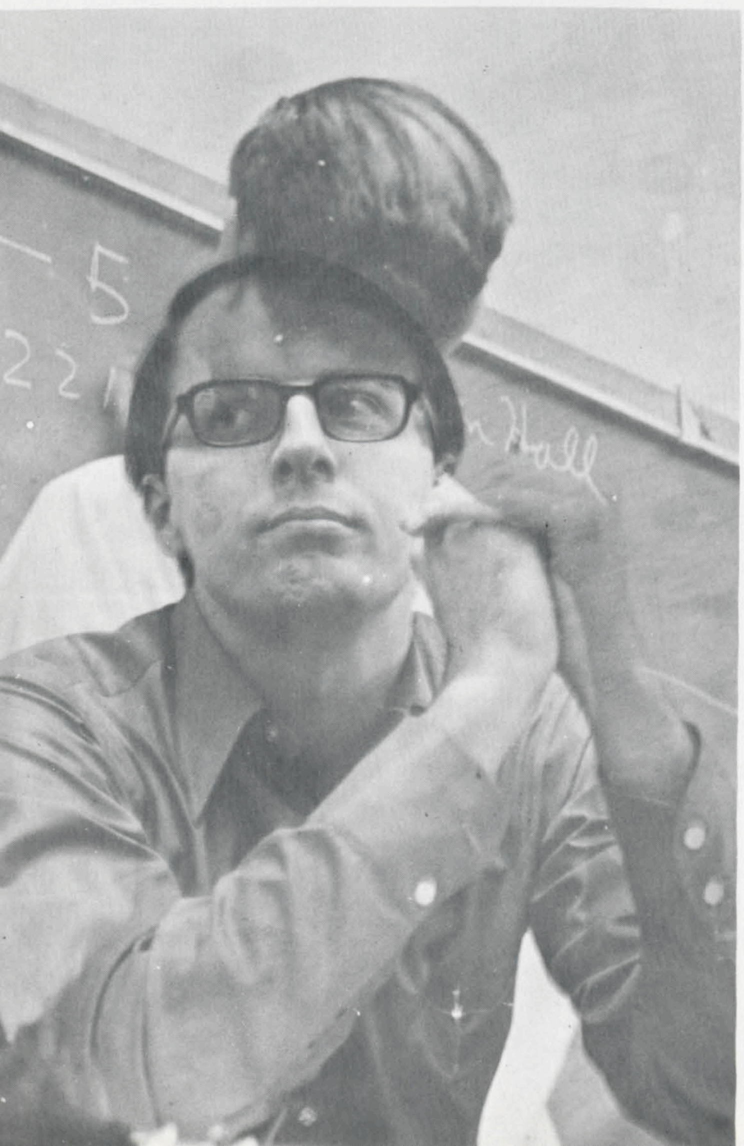
Before coming to GWU, Dr. Lang worked in the Bell Telephone Laboratories. He has also been employed as a Research Professor and as an Assistant Professor in Applied Mathematics at New York University.

Dr. Lang feels that the SEAS curriculum gives the engineering student a good education. Moreover, he was glad to see that so many students were participating in school organizations.

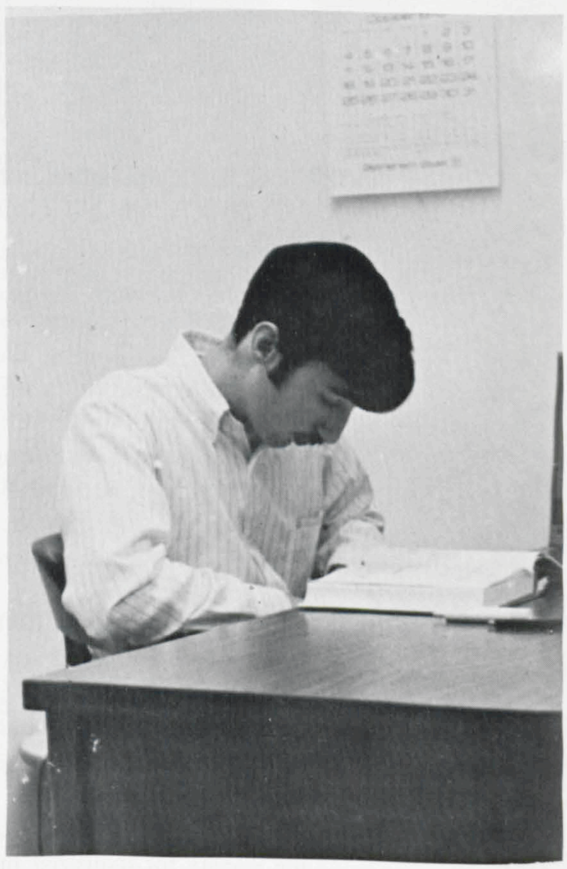
Dr. Lang is a member of the Institute of Electrical and Electronic Engineers (IEEE), the Society for Industrial and Applied Mathematics (SIAM), Sigma Xi, Tau Beta Pi, and Eta Kappa Nu. His outside interests include hiking, camping and cooking foreign cuisines.

We are happy to welcome Dr. Lang to SEAS and look forward to a mutually rewarding association.

Osmosis.



See Spot run. Run, Spot, run.



Today the Engineers' Council, tomorrow. . . .

Campus News

JOB INTERVIEW SCHEDULE

The following companies are presently scheduled to interview on campus. For more detailed information, check with the placement office in Woodhull house.

December

2nd: Chubb & Son, Inc.
3rd: Naval Ship R-D Center
4th: CAPSOM, Dept. of Navy
7th: Applied Physics Lab
8th: Cleveland Electric
Fairfax Public Schools
Federal Power Commission
Commack Public Schools
9th: Department of Commerce (Office of Secretary)
10th: U.S. Dept. of Agriculture
(Office of Inspector)
11th: Potomac Electric Power Co.

January

21st: Johns-Manville Corp.

TAU BETA PI:

The 65th National Convention of the Tau Beta Pi Association was held at The Ohio State University in Columbus, Ohio, October 8-10, 1970.

Tau Beta Pi is the national engineering honor society, now having 137 collegiate chapters, 44 chartered alumnus chapters, and an initiated membership of over 158,000. Students in the field of engineering are elected to membership by the collegiate chapters from the top 20%, scholastically, of their classes on the basis of character. Graduate engineers may be elected on the basis of their eminent achievements in the engineering profession. Steven Momii, president of the D.C. Gamma chapter on this campus, went to the Convention as a delegate. He served on Convention Site committee.

Arrangements for the 1970 Convention were made by a committee of student members and faculty advisors of the Ohio Gamma chapter at the Ohio State University. Members of the Columbus Alumnus Chapter of Tau Beta Pi and other area alumni were also instrumental in Convention preparations.

The collegiate were represented by delegates and alternates from 130 of America's leading engineering schools. Also in attendance were the Association's national officers, faculty members from a number of institutions, and representatives of several Tau Beta Pi alumnus groups.

The Convention program consisted of business meetings, an award dinner, the host chapter's initiation banquet, and informal discussion seminars. Dr. Gordon B. Carson, vice president for business and finance and treasurer of the Ohio State University, addressed the Convention at the awards dinner. The major speaker at the initiation banquet was Mr. Richard J. Anderson, assistant to the vice president of Battelle Memorial Institute in Columbus.

Three new collegiate chapters of Tau Beta Pi were granted by the Convention to General Motors Institute, Rochester Institute of Technology, and the University of Tulsa.

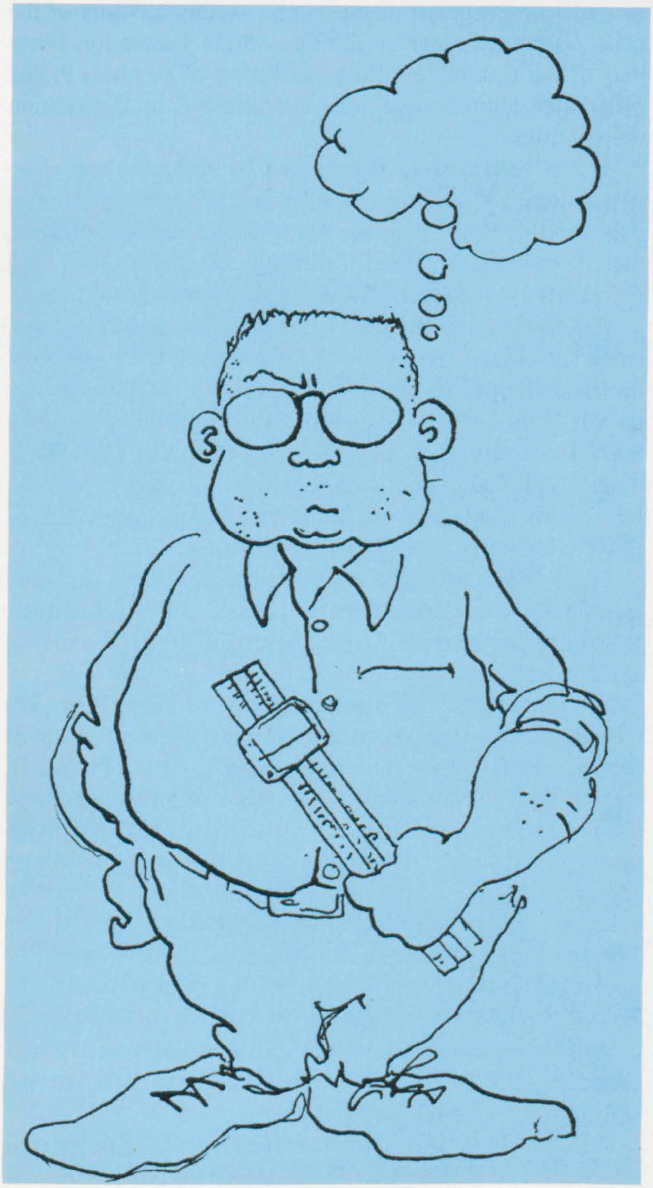
Announcement of the recipients of Tau Beta Pi's Outstanding Chapter Awards for 1969-1970 were made at the awards dinner by the President of Tau Beta Pi, Mr. H. Roy Chope. These awards are given annually to those chapters which best serve the association's goals of recognizing distinguished scholarship and exemplary character and of fostering a spirit of liberal culture in engineering colleges. The top award went to Florida Alpha at the University of Florida. An honorable mention was given to Maryland Beta at the University of Maryland. Special awards for noteworthy accomplishment in particular areas of Tau Beta Pi's activities went to South Carolina Alpha at Clemson University and to Massachusetts Zeta at the University of Massachusetts.

National headquarters of the Tau Beta Pi Association is located on the campus of the University of Tennessee,

Knoxville. Robert H. Nagel, Secretary-Treasurer, and Ralph E. Warmack, Assistant Secretary-Treasurer, are based there. Other national officers of the Association are: Director of Fellowships Paul H. Robbins; Alumni Representative John M. Kane of Louisville, Kentucky; Master of Rituals Herbert F. McGaffey of Whittier, California; and Chapter Coordinator James R. Young of Palo Alto, California.

ENGINEER'S COUNCIL NEWS

Engineer's Council Committees need help. Anyone interested, please contact the chairmen indicated:



ACADEMIC COMMITTEE:

Purpose: To provide a channel of communication of academic matters with the faculty and administration of S.E.A.S. Contact; George Aunon 481-5294.

ENGINEER'S WEEK:

Purpose: Planning Engineers' Week exhibits for National Engineers' Week on February 22-27. Theme of this year's exhibits is "Engineering to Improve the Quality of Life". Contact: Mike Seijo 587-3933 or Dick Tabor.

SCHOLARSHIP COMMITTEE:

Purpose: To work on setting up scholarship program. Contact: Lou Mogavero 768-0956.

RECRUITMENT COMMITTEE:

Purpose: To communicate between the Director of SEAS admissions, current students, and prospective students; promoting SEAS. Contact: Howie Kellman 387-0749.

COMING EVENTS:

All are invited to the Engineers' Council Dinner on Monday, December 7 from 5:30 to 7:00 p.m. in Tompkins Hall. Watch in Tompkins for future signs.

The next Engineers' Council Meeting is December 10, 1970 at 9:00 p.m. in Room 426 of the University Center. All are invited to come and participate. If you are unable to make the meeting and have ideas, suggestions, complaints, etc., leave a note in Room #100 of Tompkins Hall.

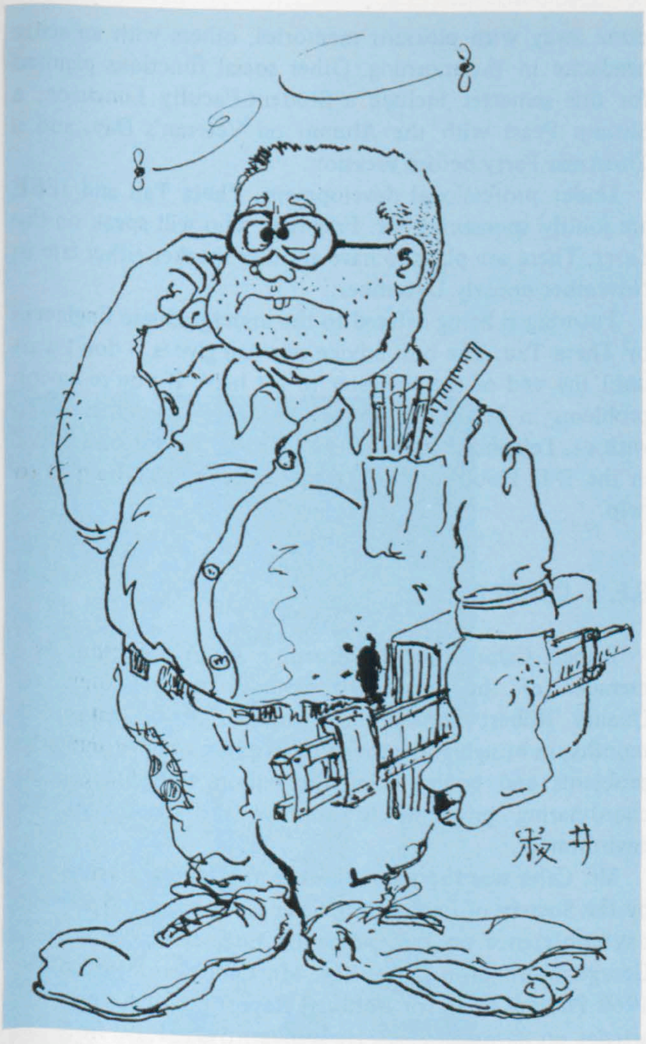
NEW FACULTY APPOINTMENTS:

Department of Civil, Mechanical and Environmental Engineering

- Chao-Mei Chen, Assistant Professor of Engineering
- Joseph Shih Wei Chi, Associate Research Professor of Engineering and Applied Science
- Gerhard Schueller, Assistant Professor of Civil Engineering
- Joseph Yahalom, Visiting Associate Professor of Materials Engineering

Department of Electrical Engineering and Computer Science

- Roger H. Lang, Assistant Professor of Engineering and Applied Science
- Ernst Weber, Adjunct Professor of Applied Science and Academic Consultant



FACULTY NEWS

Dean Harold Liebowitz has been invited to present the Distinguished Lecture at the First International Conference on Structural Mechanics in Reactor Technology, in Berlin, Germany, September 20 to 24, 1971. Dean Liebowitz's lecture is titled: "Fracture of Materials and Structures." The Dean has also been invited to present a paper at the International Conference on Mechanical Behavior of Materials to be held in Kyoto, Japan, from August 15 to 20, 1971. The title of the Dean's paper is: "A Fracture Mechanics Approach to the Nonlinear Behavior of Materials."

This conference has been organized by the Society of Materials Science, Japan, under the auspices of the Science Council of Japan and the coordination of twenty other Academic Societies of Japan.

The American Academy of Mechanics has elected Dean Liebowitz as a Founder Member. The Academy has been organized to provide a forum where engineers, mathematicians, scientists, and all others who are active in mechanics can pursue their common concerns. The Academy also promotes continuing excellence in the practice of mechanics among its members and will serve as a vehicle for the recognition of achievement.

Last summer, Dean Liebowitz was appointed to the Israeli-American Materials Advisory Group. There are eight members in the United States who are acting in an informal capacity to help in the coordination and dissemination of information, in addition to the planning of materials programs for Israel.

Dr. Alfred M. Freudenthal, Acting Chairman, Department of Civil, Mechanical, and Environmental Engineering and Director of the Institute for the Study of Fatigue and Structural Reliability has been invited to present a paper at the First International Conference on Structural Mechanics in Reactor Technology in Berlin, Germany. This conference is being sponsored by the Commission of the European Communities, Brussels; the Keratechnische Gesellschaft, and the American Society of Mechanical Engineers.

Dr. Freudenthal has also been invited to present a paper at the International Conference on Mechanical Behavior of Materials to be held in Japan in 1971. The title of his paper is "Mechanical Behavior at Elevated Temperatures."

Dr. S.W. Yuan, Professor of Engineering and Applied Science, has been selected to appear in the 1970 edition of "Outstanding Educators of America."

The Outstanding Educators of America is an annual program designed to recognize and honor those men and women who have distinguished themselves by exceptional service, achievements, and leadership in education.

Each year over 5,000 of our country's foremost educators are featured in this national volume. They are chosen for national recognition on the basis of local standards of excellence.

Dr. Walter Kurt Kahn, Chairman, Department of Electrical Engineering and Computer Science was awarded \$49,700, as principal investigator, by the National Science Foundation, in support of his research on "Mutual Coupling with Application to Array Antennas."

The specific topics to be considered in this research are grouped under three broad headings: mutual coupling, scattering and directive properties of antennas, fundamental limitations and basic theorems for antennas; and antenna interconnections and feed networks for array antennas.

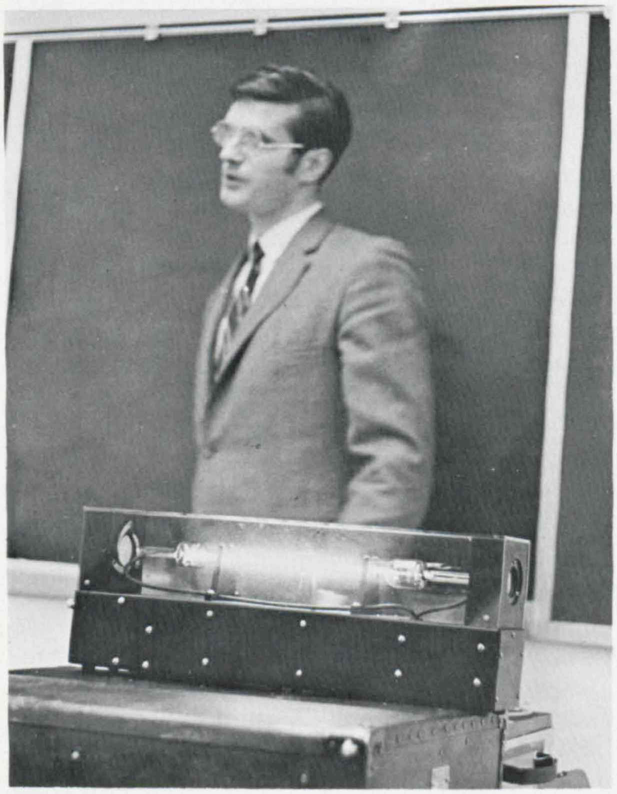
Dr. Kahn along with De. Leon Susman of Sperry Rand Research Center has co-authored a paper: Measures of Beam Concentration for Scalar Radiation." The paper was published in the July 1970 issue of Radio Science.

Dr. Ali M. Kiper, Associate Professor of Engineering, has been informed that his paper, "Minimum Bubble Departure Diameter in Nucleate Pool Boiling," has been accepted for

publication by the International Journal of *Heat and Mass Transfer.*

IEEE

The I.E.E.E. and Theta Tau fraternity sponsored a program with Mr. Richard Freeman, a representative from Bell Telephone. His presentation was about development of the laser for communications. Among those attending the lecture were Professor Lang of the Electrical Engineering Department, whose comments provided further understanding of the physics of the laser. Mr. Freeman's equipment included a dummy laser, which was used to demonstrate voice communication via modulated light. After Mr. Freeman's presentation, an informal question and answer period followed, during which he displayed plans for constructing a simple prototype laser. At the end of the talk, refreshments were served.



THETA TAU

Theta Tau began the semester with a picnic at "P" St. Beach. Freshmen joined the brothers in an afternoon of hot dogs and football, and probably had too much of each, but had a great time nonetheless. Early in October, the first party was held and it was certainly unique. Late in October, there was a mixer with DPE sorority. Some of the brothers came away with pleasant memories, others with an acute headache in the morning. Other social functions planned for this semester include a Student-Faculty Luncheon, a Shrimp Feast with the Alumni on Veteran's Day, and a Christmas Party before vacation.

Under professional development, Theta Tau and IEEE are jointly sponsoring Mr. Freeman, who will speak on the Laser. There are plans to have another speaker either late in November or early December.

Tutoring is being offered to the undergraduate Engineers by Theta Tau. The best advice one can give is – don't wait until the end of the semester to get help. If you're having problems in Math, Physics, Chemistry, etc., get in touch with us. Telephone numbers are listed on the bulletin board in the D-H House and in Tompkins Hall. We'll be glad to help.

S.E.S. CONFERENCE

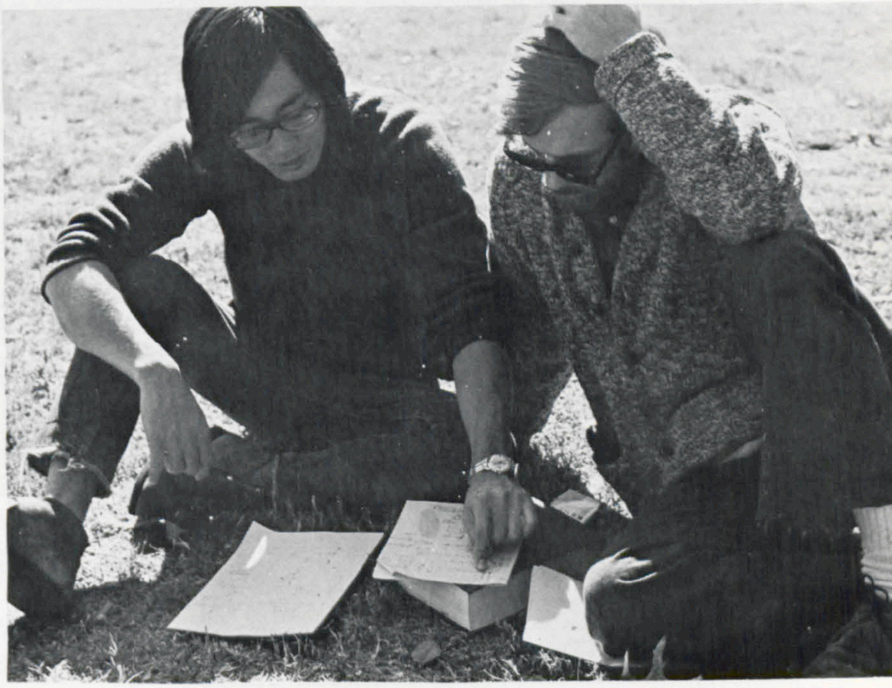
Robert Cahn is doing something about pollution. As a member of the President's Council on Environmental Quality, Robert Cahn has been involved, for the last several months, in bringing together a description of environmental problems and issues facing the nation with the goal of coordinating programs to improve the quality of the environment.

Mr. Cahn was the guest speaker at a banquet sponsored by the Society of Engineering Sciences as part of their three day conference on Environmental Engineering held at the George Washington University. Mr. Cahn was awarded the 1969 Pulitzer Prize for National Reporting for his series of articles on national parks. He is presently on leave from the Washington Bureau of The Christian Science Monitor. His past experience includes being a reporter for the Seattle Star, the Pasadena Star-News, and Life Magazine; an editor of Collier's and the Saturday Evening Post; and the White House correspondent for the U.S. Information Agency.

In his address, Mr. Cahn explained the Council's authority and its goals, and he cited several examples of what the Council is accomplishing. Each year, the Council must report to the President on the status and condition of every major phase of the environment. It must also report on current and foreseeable trends in quality, management and utilization of the environment, and the adequacy of available natural resources. The Council must review the environmental programs of the Federal Government, the State and local governments, and private agencies or individuals. Finally, the Council must submit a program for remedying the deficiencies of existing programs and activities, together with recommendations for legislation. "We have reversed the trend of thinking," Cahn said. "Those responsible for pollution are no longer allowed to continue polluting the environment until it can be shown that their methods of operation are unjustifiable. Instead, these agencies must show that their methods are justifiable."

How one looks after four years.

Tora, Tora.



The engineering life.

Page 1

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